

Pre-rehabilitation sense of coherence as a predictor of symptom change after rehabilitation

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Abstract

Sense of coherence (SOC) constitutes the key component of salutogenesis theory. It reflects individuals' confidence that their environment is comprehensible and manageable and that their lives are meaningful. Research demonstrates a strong cross-sectional relationship between SOC and mental health. However, little is known about SOC's temporal stability and its potential to predict changes in psychopathological symptom severity in different settings. The goal of the current study was to address this gap. The sample of the two-wave longitudinal study consists of 294 patients receiving inpatient psychotherapeutic (and psychopharmacological) treatment for various psychological disorders at a German psychosomatic rehabilitation clinic. SOC (Antonovsky, *Social Science & Medicine*, 1993, 36, 725–733) and outcome measures (i.e., general mental health problems, depression and anxiety symptoms) were assessed within two days of arrival and at the end of rehabilitation (week 5/6). SOC was significantly enhanced after treatment whereas psychopathological symptoms were significantly reduced. Regression analyses revealed that pre-treatment SOC was a significant negative predictor of post-treatment symptom severity for all outcome measures even after controlling for pre-treatment symptoms. The current findings provide first evidence that SOC is a significant unique predictor of symptom change. Future studies need to further investigate longitudinal associations between SOC and mental health outcomes in different settings.

KEYWORDS

anxiety, depression, longitudinal study, rehabilitation, salutogenesis, sense of coherence

1 | INTRODUCTION

Sense of coherence (SOC) is the key component of Antonovsky's theory of salutogenesis (1979, 1987). SOC is defined as a global orientation in life that “expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that one's internal and

external environments are predictable and that there is a high probability that things will work out as well as can reasonably be expected” (Antonovsky, 1979, p. 10). Individuals with high levels of SOC perceive their environment as comprehensible and manageable and believe that their lives are meaningful.

SOC has been identified as a powerful correlate of mental health (Eriksson & Lindström, 2006), whereas its association with physical health is weaker and less consistently found (Flensburg-Madsen,

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Ventegodt, & Merrick, 2005). Recent meta-analyses show that a stronger SOC is related to lower levels of psychopathological symptoms in traumatized individuals (Schäfer, Becker, King, Horsch, & Michael, 2019) and informal caregiving (del Pino-Casado, Espinosa-Medina, López-Martínez, & Orgeta, 2019). Despite these findings on SOC's cross-sectional association with mental health, longitudinal research into SOC's association with psychopathological symptoms is scarce. With respect to posttraumatic stress symptoms, to the best of our knowledge, only one study exists that investigated pre-trauma SOC levels as a predictor of posttraumatic responses. Engelhard, van den Hout, and Vlaeyen (2003) reported findings of a longitudinal study on pregnant women whose SOC levels were measured in early pregnancy. Initial SOC levels (assessed around 8 weeks of pregnancy) were predictive of posttraumatic stress symptoms 1 month after pregnancy loss and accounted for 6% of variance. In this study, SOC's predictive value was also evident for depressive symptoms after controlling for baseline depression levels. In line, another study in a sample of participants demonstrating significant baseline depressive symptoms (BDI score > 13) found SOC to be predictive of depression after one and 9 years (Luutonen, Sohlman, Salokangas, Lehtinen, & Dowrick, 2011, but see: Kivimäki, Feldt, Vahtera, & Nurmi, 2000).

However, on a conceptual level, SOC's strong—mostly cross-sectional—associations with psychopathological symptoms (e.g., $r = -.75$ for depression [Flannery & Flannery, 1990]) challenge its role as an independent construct (Bachem & Maercker, 2016). Indeed, it has been suggested that SOC, as measured by the Antonovsky scales (Antonovsky, 1993), merely reflects an inverse measure of psychopathology (Geyer, 1997; Gruszczynska, 2006). Correspondingly, studies that have found changes in SOC over short periods of time (Vastamaeki, Moser, & Paul, 2009) and across the lifespan (Breslin, Hepburn, Ibrahim, & Cole, 2006; Feldt, Leskinen, Kinnunen, & Ruoppila, 2003) question SOC's conceptualization as a stable “dispositional orientation” proposed to stabilize over the lifespan.

To resolve the continuing debate on SOC's conceptual validity, more longitudinal research that differentiates SOC's role as a predictor and/or outcome of mental health is needed. This is of particular relevance in the context of mental health changes through interventions like psychotherapy. Given SOC's conceptualization as a stable disposition initiating and modulating coping processes (Mittelmark et al., 2017), such a predictive role may be evident, since psychotherapy might also be seen as a training of coping skills (Goldfried, 1980). To date, only few longitudinal studies have investigated SOC in relation to psychotherapeutic treatment. Moreover, recent research supports the importance of assessing resilience as an outcome of psychotherapy (Reyes et al., 2018) and simultaneously finds SOC to be the most comprehensive concept in the field of resilience (Almedom, 2005; Grevenstein et al., 2016) supporting its potential role as treatment outcome. Moreover, high levels of SOC may constitute a protective factor against the (re-) development of psychopathological symptoms in case of exposure to substantial life stressors. Thus, strengthening SOC might be an important goal in psychotherapy in terms of prevention of future mental health issues. Apart from this notion underlining the

relevance of a longitudinal perspective, existing studies have exclusively focused on treatment-related changes in SOC as an outcome. For instance, a 2-year psychodynamic group therapy (46 sessions) for women that had experienced sexual childhood abuse and a treatment for major depression were found to significantly increase SOC levels (Lundqvist, Svedin, Hansson, & Broman, 2006; Skärsäter et al., 2009). Similar effects were demonstrated for an 8-week mindfulness-based stress reduction program in fibromyalgia patients (Weissbecker et al., 2002) and a 57-week rehabilitation program for chronic pain disorder (Lillefjell & Jakobsen, 2007). While these findings provide first indications regarding the temporal (in) stability of SOC and its role as a relevant therapy outcome measure, they do not offer any insights regarding its predictive value for symptom change. To the best of our knowledge, no study so far has investigated the role of pre-treatment SOC as a predictor of psychotherapy outcome, meaning a predictor of change in psychopathological symptom levels over a short period of time. The current study aims to address this gap by firstly examining SOC's stability during a brief psychosomatic rehabilitation intervention and by analysing its role as a predictor of post-treatment psychopathological symptom levels. Such a study is of interest since changes over a brief period of time would further question SOC's temporal stability as proposed by Antonovsky (1979, 1987) but may at the same time provide first evidence that SOC is able to predict short-term changes in psychopathological symptom levels.

2 | METHOD

2.1 | Sample recruitment

The recruitment took place at a psychosomatic rehabilitation clinic in Blieskastel (Germany) from June 2018 until February 2019. Psychosomatic rehabilitation is part of the German system of rehabilitative care (see Lukasczik et al., 2011 for details). Psychosomatic rehabilitation consists of a 5–6-week inpatient treatment aiming to maintain or rebuild patients' employability. Rehabilitation is multidisciplinary and consists of individual and group psychotherapy (based on cognitive behavioural or psychodynamic techniques) and a set of add-on interventions (e.g., psychopharmacological treatment, exercise groups, occupational therapy, etc.), which differ between patients. To monitor treatment quality psychopathological symptoms are usually assessed twice (within two days of arrival and in the last week of patients' stay) using a set of standardized measures. For the current study, patients were additionally asked to complete a questionnaire concerning depressive and aggressive symptoms and two SOC measures (Antonovsky, 1993; Bachem & Maercker, 2016). The findings on the questionnaire assessing depression and aggression will be reported elsewhere. Results of the second SOC measure (Bachem & Maercker, 2016) are summarized below and are presented in detail as Appendix S1.

The study was approved by the Ethic Committee of the Saarland University (18-01) and was pre-registered (ID: DRKS00014002). All patients gave written informed consent in accordance with the Declaration of Helsinki (World Medical Association, 2013).

2.2 | Sample characteristics

Three hundred and fifteen patients of the psychosomatic rehabilitation clinic participated in the current study. Twenty-one participants were excluded since they did not complete the pre-treatment SOC measure (Figure 1 shows a flow chart of the study sample). Mean age was 53.13 years ($SD = \pm 7.92$, range: 20–74 years) and 72% of the patients were female. Primary diagnoses according to DSM-5 categories (American Psychiatric Association, 2013) are listed in Table A1.

2.3 | Measures

2.3.1 | Sense of coherence

SOC-A

SOC as defined by Antonovsky (1979) was measured using the German 13-item short version of the Antonovsky scales (SOC-13; German version: Singer & Brähler, 2007; English original: Antonovsky, 1993) (hereinafter referred to as SOC-A). SOC-13 uses a bipolar seven-point scale with a verbal anchor on each pole (four items were recoded). In the current sample, SOC-13 showed good internal consistency reflected in a Cronbach's alpha (α) of .84.

SOC-R

Due to the conceptual criticism of the SOC scale developed by Antonovsky (1993), SOC was additionally assessed using the revised version of the SOC scale proposed by Bachem and Maercker (2016) (hereinafter referred to as SOC-R). The SOC-R scale consists of 13 items, which are rated on a five-point scale ranging from "not at all true" to "extremely true" (one item was recoded). In the current

sample, SOC-R demonstrated an acceptable internal consistency with $\alpha = .73$.

2.3.2 | General mental health

General psychopathological symptom burden was assessed using a German self-report questionnaire (original: Hamburger Module zur Erfassung allgemeiner Aspekte psychosozialer Gesundheit für die therapeutische Praxis; HEALTH-49; Rabung et al., 2009). The Health-49 comprises 49 items that assess somatic and psychopathological symptoms using six subscales. For the purpose of the current study, the index for general mental health (GMH) problems (original: Psychische und somatoforme Beschwerden) was used. Scores range from 0 to 4. The Health-49 has shown sufficient reliability reflected in $\alpha = .85$ for the GMH problems index in a sample of patients of a psychosomatic rehabilitation program in Germany (Rabung et al., 2009).

2.3.3 | Depressive symptoms

To assess depressive symptoms over the last 2 weeks, the German version of the Beck Depression Inventory II (BDI-II; German version: Hautzinger, Keller, & Kühner, 2006) was used. It contains 21 items related to depression with scores ranging from 0 to 63. The BDI-II has shown good internal consistencies in depressive samples ($\alpha = .93$) and in patient samples with other primary diagnoses (e.g., anxiety disorders, somatoform disorders, etc.) ($\alpha = .92$) (Hautzinger et al., 2006). Moreover, sufficient internal consistencies have also been shown in a similar patient sample of a psychosomatic rehabilitation clinic ($\alpha = .88$) (Bauernhofer et al., 2018).

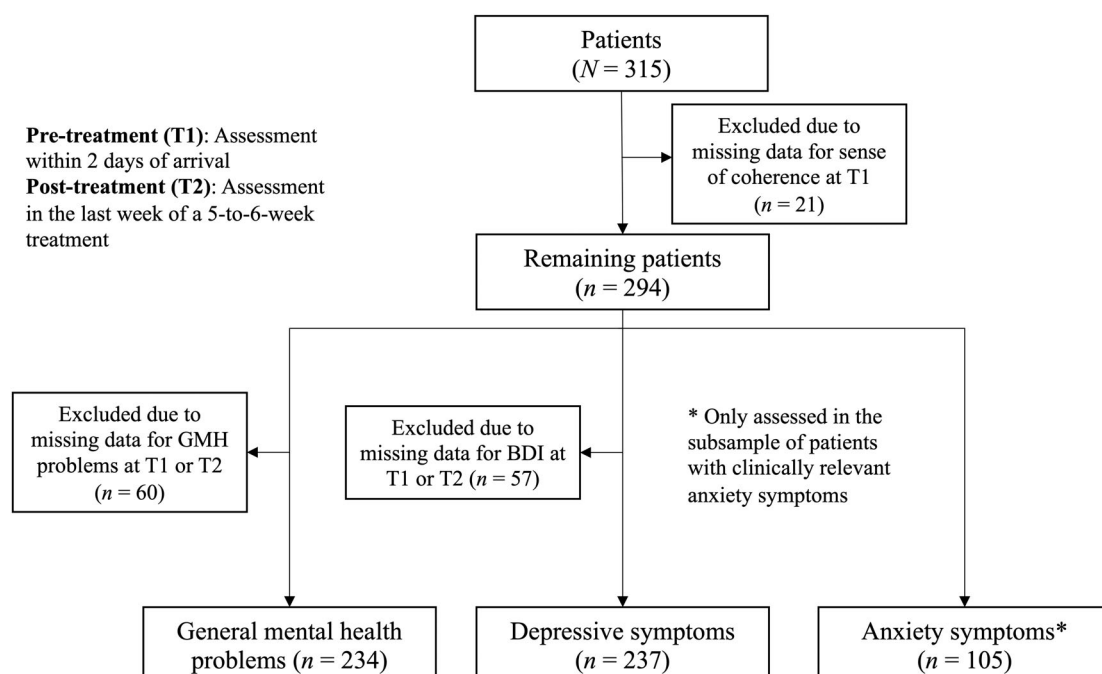


FIGURE 1 Flow chart of the study sample

2.3.4 | Anxiety symptoms

Anxiety symptoms for the last week were assessed using the German version of the Beck Anxiety Inventory (BAI; German version: Margraf & Ehlers, 2007). The BAI contains 21 items related to anxiety and scores range from 0 to 63. Internal consistencies have shown to be high ($\alpha = .90$) in a sample of patients with anxiety disorders (Margraf & Ehlers, 2007) as well as in a sample of patients from a psychosomatic clinic in Germany ($\alpha = .93$). The BAI was administered by individual therapists based on clinical judgement in the subsample of patients showing clinically relevant anxiety symptoms at pre-treatment assessment.

2.4 | Data analyses

Analyses were conducted using SPSS version 25 (IBM Corp, 2017). Descriptive statistics were computed to illustrate sample characteristics in terms of frequencies, means (M) and standard deviations (SD).

Pre- to post-treatment change of psychopathological symptoms and SOC-A/-R levels were analysed using t -tests for paired samples. Bivariate Pearson correlation coefficients were used to assess the relationship between SOC-A/-R and outcome measures. To analyse the relevance of pre-treatment SOC-A/-R as a predictor of treatment outcomes, hierarchical regressions were conducted per outcome including the first assessment of the outcome (pre-treatment levels for GMH problems, depression and anxiety symptoms) in the first step and pre-treatment SOC-A/-R in the second step. We used a regression approach since this was shown to be superior to correlation analyses using change scores (Overall & Woodward, 1975). The change in R^2 (ΔR^2) represents the unique amount of variance accounted for by SOC-A/-R. ΔF was used to assess the significance of ΔR^2 . Due to missing data, degrees of freedom varied between analyses.

3 | RESULTS

3.1 | Pre- to post-treatment changes in symptom levels and SOC-A

Paired t -tests for all outcome measures show a significant decrease in symptom severity for GMH problems ($t(233) = -13.33, p < .001, d = 0.87$), depression ($t(236) = 15.71, p < .001, d = 1.02$), and anxiety ($t(104) = 5.16, p < .001, d = 0.50$) from pre- to post-treatment. By contrast, SOC-A increased significantly during this period of time ($t(167) = 4.51, p < .001, d = 0.35$) (see Table 1 for descriptive statistics). An exploratory analysis on the moderating effect of age on the change of SOC-A levels over time did not reveal a significant result ($F(1, 151) = 0.26, p = .612$).

3.2 | Bivariate correlations between SOC-A and measures of psychopathological symptoms

Table 1 presents the Pearson correlation coefficients between SOC-A and all outcomes (i.e., GMH problems, depressive and anxiety

symptoms). SOC-A showed significant associations with all symptom measures at the pre- and post-treatment assessments (all p 's $< .001$). Numerically larger correlations were observed between SOC-A and symptom scores measures at the same time point (pre- and post-treatment) (e.g., pre-treatment SOC-A and pre-treatment BDI versus pre-treatment SOC-A and post-treatment BDI).

3.3 | Prediction of symptom change based on pre-treatment SOC-A

Multiple hierarchical regressions were used to predict symptom changes based on pre-treatment SOC-A (see Table 2). Pre-treatment symptom and SOC-A levels significantly predicted post-treatment GMH problems ($R^2 = .47, F(2, 231) = 100.56, p < .001$). Pre-treatment SOC-A explained a significant but small unique amount of variance ($\Delta R^2 = .01$) in post-treatment GMH problems ($\beta = -.13, t(231) = -.20, p = .029$), whereby higher pre-treatment SOC-A levels were related to fewer post-treatment symptoms. However, both predictors shared 19% of the explained variance in post-treatment symptom levels.

Analyses concerning depression symptoms, revealed similar results. Taken together, pre-treatment depression levels and pre-treatment SOC-A accounted for 31% of the variance in post-treatment depression ($F(2, 234) = 52.48, p < .001$). Again, pre-treatment SOC-A explained a significant ($\Delta R^2 = .01$)—although small—amount of variance in post-treatment depression ($\beta = -.14, t(234) = -.20, p = .035$). Higher levels of pre-treatment SOC-A were associated with fewer remaining depressive symptoms. Both predictors shared 15% of the variance in post-treatment symptom levels.

Albeit in a smaller sample, a similar pattern of results was found for anxiety symptoms ($n = 104$). Taken together, pre-treatment anxiety symptoms and pre-treatment SOC-A accounted for 46% of variance in post-treatment symptoms ($F(2, 102) = 43.55, p < .001$). Pre-treatment SOC-A included in the second step explained a small but significant ($\Delta R^2 = .02$) unique amount of variance ($\beta = .17, t(102) = -2.06, p = .042$). Again, higher levels of pre-treatment SOC-A were related to fewer post-treatment anxiety symptoms. However, a large amount of variance in post-treatment anxiety levels (18%) was shared by both predictors.

3.4 | Findings on SOC-R

SOC-A and SOC-R were significantly correlated at pre- ($r = .40, p < .001$) and post-treatment ($r = .36, p < .001$) assessment. In contrast to SOC-A, SOC-R scores did not change significantly over time ($t(160) = -1.45, p = .150, d = 0.23$). As in case of SOC-A, SOC-R demonstrated significant associations with all symptom measures at pre- and post-treatment (all p s $< .05$). However, different from SOC-A, SOC-R did not account for a significant amount of variance in pre- to post-treatment symptom change for GMH problems and depression, while it uniquely explained 5% of the variance in post-treatment anxiety levels ($\beta = -.22, t(97) = -2.97, p = .004$). See Appendix S1 for detailed results on SOC-R.

TABLE 1 Relationship between mental health outcomes and sense of coherence

	<i>M (SD)</i>	2	3	4	5	6	7	8
BDI–T1 (1)	22.89 (10.98)	.54**	.77**	.55**	.67**	.46**	–.58**	–.45**
BDI–T2 (2)	12.17 (11.01)		.49**	.82**	.51**	.77**	–.40**	–.54**
GMH problems–T1 (3)	1.53 (0.79)			.67**	.77**	.54**	–.56**	–.41**
GMH problems–T2 (4)	0.99 (0.74)				.63**	.85**	–.46**	–.52**
BAI–T1 (5)	23.47 (12.76)					.66**	–.50**	–.52**
BAI–T2 (6)	18.13 (13.01)						–.44**	–.60**
SOC-A–T1 (7)	49.43 (12.07)							.58**
SOC-A–T2 (8)	53.26 (11.92)							

Abbreviations: BAI, Beck Anxiety Inventory; BDI, Beck Depression Inventory II; GMH problems, Health-49 subscale for general mental health problems; SOC-A, Sense of coherence scale - short version (Antonovsky, 1993); T1, assessment within two days of arrival, that is, pre-treatment; T2, assessment within the last week of a 5/6-week treatment, that is, post-treatment.

** $p < .001$.

	<i>B</i>	<i>SE B</i>	β	<i>t</i>	<i>p</i>	ΔR^2	ΔF
General mental health problems (T2, post-treatment)							
GMH problems–T1	0.57	0.05	.61	10.54	< .001	.26	111.03
SOC-A–T1	–0.01	0.00	–.13	–2.20	.029	.01	4.84
Depressive symptoms (T2, post-treatment)							
BDI–T1	0.47	0.07	.47	7.12	< .001	.15	50.68
SOC-A–T1	–0.12	0.06	–.14	–2.12	.035	.01	4.48
Anxiety symptoms (T2, post-treatment)							
BAI–T1	0.59	0.08	.58	7.06	< .001	.26	49.90
SOC-A–T1	–0.18	0.09	–.17	–2.06	.042	.02	4.23

TABLE 2 Prediction of change in symptoms based on pre-treatment sense of coherence

Note: The columns reporting ΔR^2 and ΔF refer to hierarchical regression analyses in which each variable was included in the last step. p -values of the beta-weights and ΔF are equal and hence not reported twice.

Abbreviations: BAI, Beck Anxiety Inventory; BDI, Beck Depression Inventory II; GMH, Health-49 subscale for general mental health problems; SOC-A, Sense of coherence scale—short version (Antonovsky, 1993); T1, assessment within two days of arrival, that is, pre-treatment; T2, assessment within the last week of a 5/6-week treatment, that is, post-treatment.

4 | DISCUSSION

The current findings demonstrate that SOC as measured by the 13-item Antonovsky scale (Antonovsky, 1993) increased during a brief intervention in a psychosomatic rehabilitation clinic. Changes in SOC-A were small to medium but significant. Correlation analyses revealed that pre-treatment and post-treatment SOC-A levels were significantly associated with all measures of symptom burden. Critically, pre-treatment SOC-A predicted symptom change for all outcomes, that is, GMH problems, depression and anxiety symptoms. SOC-A's contribution remained significant even after controlling for pre-treatment symptom levels, which accounted for considerably larger amounts of variance ($\geq 15\%$) than pre-treatment SOC-A levels alone ($\leq 2.2\%$). Findings on SOC-R partly corresponded with those for SOC-A but were less consistent: In contrast to SOC-A, SOC-R scores did not change significantly from pre- to post-treatment. Moreover, with respect to post-treatment GMH problems and depression, SOC-R did not exhibit incremental validity beyond initial symptom

levels. However, SOC-R uniquely accounted for 5% of variance in post-treatment anxiety symptoms.

In line with previous findings (Lillefjell & Jakobsen, 2007; Lundqvist et al., 2006; Weissbecker et al., 2002), the current study shows that SOC-A levels changed over a short period of time and seemed to be affected by psychotherapy: SOC-A levels increased as symptom levels decreased. However, while previous intervention studies investigated SOC changes following interventions of at least two months in younger populations ($M_{\text{age}} \leq 48$ years), our findings demonstrate that changes in SOC might also occur following brief interventions and in older populations. This, in turn, challenges Antonovsky's (1979, 1987) conceptualization of SOC as a dispositional orientation stabilizing over the life-span beginning at the age of 30 (Mittelmark et al., 2017). Moreover, an additional exploratory analysis did not provide evidence for a moderating effect of age on SOC changes, suggesting that temporal stability of SOC was not more (or less) pronounced in older participants. The absence of such an effect is in line with previous studies (Feldt et al., 2003) and further

questions the concept of SOC as proposed by Antonovsky (1979, 1987). On a conceptual level, SOC may be developed during childhood and youth and may also exhibit substantial stability (Breslin et al., 2006; Feldt et al., 2006; Schnyder, Büchi, Sensky, & Klaghofer, 2000, but see: Takayama et al., 1999). However, its stability may depend on specific circumstances (e.g., high baseline SOC-A levels; Feldt et al., 2003; Volanen, Suominen, Lahelma, Koskenvuo, & Silventoinen, 2007) and SOC may also be sensitive to interventions as already evidence be previous studies (Vastamaeki et al., 2009). Future studies need to investigate if these SOC-A changes following psychotherapy or other interventions remain stable or if individuals return to their initial SOC-A levels, which may in turn support Antonovsky's concept Antonovsky (1979, 1987) of a rather stable orientation. Interestingly, in the present study SOC-R scores did not change over time, which may suggest that SOC-R captures the dispositional character of SOC as it has been proposed for the revised scale (Bachem & Maercker, 2016). However, future studies need to investigate differences between the SOC measures in greater detail. If these studies would demonstrate stable SOC changes—using different measures—following even brief interventions, these changes might be clinically relevant, since SOC-A was found to be a predictor of physical (Suominen, Helenius, Blomberg, Uutela, & Koskenvuo, 2001; Surtees, Wainwright, Luben, Khaw, & Day, 2006) and mental health (Kouvonen et al., 2010; Luutonen et al., 2011; Remes et al., 2018).

Corresponding to previous studies (del Pino-Casado et al., 2019; Streb, Häller, & Michael, 2014), we found a robust relationship between SOC-A/-R levels and psychopathological symptoms, which was also reflected in a large overlap of explained variance in post-treatment symptom levels for all outcomes. However, the current findings also demonstrate that pre-treatment SOC-A levels predict changes in symptom severity. This pattern of results was found to be remarkably consistent across all outcome measures. As such, our results provide first evidence that SOC-A is a predictor of change in mental health and not merely an inverse measure of psychopathology (Geyer, 1997; Gruszczynska, 2006). Thereby, our findings are in line with previous studies that found SOC-A to be a partly overlapping, but not redundant to measures of psychopathology (Schnyder et al., 2000). For instance, Kouvonen et al. (2010) found SOC-A to be predictive of psychiatric disorders during a 19-year-follow-up, even after controlling for baseline mental health characteristics. Moreover, Konttinen, Haukkala, and Uutela (2008) described similar correlations between measures of depression and anxiety and SOC-A and psychopathological symptom severity, which is in line with our findings. Thus, correspondingly with previous findings, our results support the notion that SOC-A seems to constitute a partly overlapping construct but is not redundant. Findings on SOC-R were less consistent: Pre-treatment SOC-R levels only demonstrated incremental validity beyond initial symptom levels in case of anxiety symptoms. Given the substantial bivariate correlations between SOC-R and psychopathological symptom levels, these results may evidence that SOC-R—as it has been criticized for SOC-A (Bachem & Maercker, 2016; Geyer, 1997) — strongly overlaps with current psychopathology without having

incremental validity. However, this is inconsistent with our finding that SOC-R scores did not change over time, while symptom levels decreased significantly. Since the current study was not predominantly designed to compare SOC measures, future studies need to address this aspect more detailed.

It is important to address the limitations of the current study. Firstly, the study investigated SOC's role in the context of a psychosomatic rehabilitation intervention and was thus observational in nature. As a result, the design did not include a (randomized) control group that did not receive any treatment during the same period of time. Thus, SOC-A changes may also occur during a similar period of time without an intervention. Moreover, due to non-random post-treatment missing data for SOC-A (post-treatment $n = 168$), we were not able to apply random intercept cross-lagged panel models which are more suited to establish causality in longitudinal panel data (Hamaker, Kuiper, & Grasman, 2015). Future studies should apply these models in larger samples. Moreover, the potentially non-random missing of post-treatment SOC-A data may have also limited our findings on the increase of SOC-A levels over time. Furthermore, future studies should also make use of advanced assessment methods such as experience sampling methods that allow for frequent assessments of SOC-A and psychopathological symptom levels over time (Palmier-Claus, Haddock, & Varese, 2019). Such studies may also provide further insights into temporal causality of the relationship between SOC and psychopathological symptoms. Moreover, our study used a brief and multidisciplinary intervention that also included psychopharmacological treatment. This may have resulted in high proportions of unsystematic variance. In addition, the predictive validity of SOC as a global orientation in life might be more pronounced studying interventions using more homogeneous samples (e.g., traumatized individuals, as SOC-A has been shown to be strongly related to posttraumatic stress symptoms) (Schäfer et al., 2019) and manualized interventions. Due to high rates of comorbidity (50% of the patients were diagnosed with at least two mental disorders) in the current sample, we were not able to assess if the predictive value of pre-treatment SOC-A/-R levels varied between different patient groups (e.g., depressive vs. anxiety disorders). Future studies should close this gap.

Furthermore, if future studies find SOC to be relevant as a predictor and/or outcome of psychotherapy, these may inspire future large-scale research, which may investigate whether SOC is more relevant for change in psychopathological symptoms in treated or untreated populations and if higher levels of SOC may increase the effectiveness of specific treatments. Such findings could be of great clinical use to integrate resilience-related concepts and state-of-the-art psychotherapy.

Overall, the current study demonstrated that SOC-A levels increased during a 5/6-week rehabilitation treatment. Moreover, for the first time, we showed that pre-treatment SOC-A levels were predictive of change in psychopathological symptoms, that is, GMH problems, depression, and anxiety symptoms. Findings for SOC-R—an alternative assessment of SOC—were partly corresponding but are less consistent and require further studies. Future research should investigate the influence of SOC-A/-R as a predictor of change in

psychopathological symptoms over longer periods of time, in various settings and patient populations, as well as using assessment methods allowing for cross-lagged panel analyses.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

AUTHORS CONTRIBUTION

Sarah K. Schäfer, Christian G. Schanz, M. Roxanne Sopp, Tanja Michael and Michael Käfer designed and planned the study. Christian G. Schanz and Michael Käfer collected the data. Sarah K. Schäfer, M. Roxanne Sopp and Johanna Lass-Hennemann analysed the data and interpreted the results. Sarah K. Schäfer and M. Roxanne Sopp wrote the manuscript. All authors reviewed the manuscript.

DATA AVAILABILITY STATEMENT

Data are accessible and available upon request.

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ENDNOTE

¹Post-treatment SOC-A/-R levels were missing when therapists forgot to hand out the additional paper-and-pencil questionnaires for SOC assessment or when patients did not return the questionnaires to their therapist at the end of their stay. We assume that these missing data are not entirely random but more likely in patients with more severe psychopathological symptoms.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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APPENDIX:
PRE-REHABILITATION SENSE OF COHERENCE AS A PREDICTOR
OF SYMPTOM CHANGE DURING REHABILITATION

TABLE A1 Patient characteristics according to DSM-5 categories

Primary diagnosis	Females		Age	
	<i>n</i>	%	<i>M</i>	<i>SD</i>
Depressive disorders	82	73.2	53.93	6.94
Bipolar and related disorders	2	100.0	49.50	0.71
Anxiety disorders	26	61.5	50.91	8.50
Obsessive-compulsive and related disorders	1	100.0	20.00	-
Trauma- and stressor-related disorders	115	67.0	53.10	8.66
Adjustment disorder	109	63.4	53.44	8.64
Posttraumatic stress disorder	6	100.0	47.75	5.74
Somatic symptom and related disorders	49	87.8	54.40	4.88
Substance-related and addictive disorders	1	100.0	59.00	-
Neurodevelopmental disorders (i.e., ADHD)	1	0	58.00	-
Personality disorders	2	0	48.50	16.26
Other primary diagnosis (e.g., Irritable Bowel Syndrome)	15	88.24	48.00	15.38

Note: Table A1 displays primary diagnoses. Rate of comorbidity in the current sample was high, that is, 50% were diagnosed with a secondary or tertiary mental disorder.

Abbreviations: ADHD, attention deficit hyperactivity disorder; *M*, mean; *SD*, standard deviation.